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emergencies as they arose, which were often beyond any means of military or official solution.

The remaining parts of the appendix give detailed statements about the winding engines, pumping plant and the relative value and efficiency of various coals, African and English; and the last section gives a tabular statement of the yield of the mines, year by year, since the consolidation in 1888. This is a most remarkable body of statistics, well worthy of careful examination.

The report volume would be much more valuable if a single good map of the region dealt with so extensively in all the historical chapters accompanied it. Two or three little maps of special localities, and one of the railroad systems, in part, are all that are given. The book has a good index, but is wholly lacking in a table of contents, either at the beginning of the volume or at the head of each chapter. This again is a great defect.

Mr. Williams has written a great book that reads like a romance; and the tale of Sinbad the Sailor and his valley of diamonds is as nothing compared with the story of the discovery of mines which up to the present have produced more than \$500,000,000 worth of uncut diamonds—with little diminution of the output in sight to-day; of the building of cities and railroads in the wilderness; of mines equipped with machinery made in Chicago and London—machinery that is almost human in its accuracy. The literature quoted in the volume is an admirable exposition not only of the history of the mines, but of the entire South African region. From the finding of the diamond by the children of Samuel Jacobs, the handing of the crystals by van Niekerk to a traveling trader, John O'Reilly, and the identification of it by Lorenzo Boyes, to the working of a shaft to a depth of 1,400 feet, is a story without parallel. The wonderful finding of the diamond on the Vaal River on the Gong Gong, and discovery at Kimberley only a few years later, are described so vividly as to have an interest such as few works on travel afford us. Here we have also the story of the thousands of claims that seventeen years later were consolidated into a great

corporation through the genius and organizing powers of Cecil J. Rhodes.

The discovery of diamonds in South Africa has done more to open up that country than all other industries together, for it was the encouragement from the sale of diamonds that precipitated the Matabele war which led to the discovery of gold in the Transvaal, in value many times exceeding that of the diamond fields of the region. The change from a multitude of individual claims, that gave the district the appearance of gigantic ruins, to the working by the shaft system was organized under Mr. Williams's administration. The employment of contract and native labor, the latter often obtained more than 1,000 miles from the mines, and the utilization of the most approved mining machines, replacing the old wheelbarrows and cradles of the earlier days, meant that the cost of mining diamonds was reduced to a fraction of what it was before, and that there was nothing to be feared from the lowering of the price by dealers who purchased stolen material. When we realize that South Africa has recently produced in one decade more than ten times the value of all the diamonds ever found in Brazil, and that this immense production dates from the discoveries begun in 1867, we may realize in a slight degree how great a change has taken place in the world's diamond production within the lifetime of a single generation.

GEORGE F. KUNZ.

Vergleichende chemische Physiologie der niederen Thiere. Von Dr. OTTO VON FÜRTH, Privatdocent und Assistent am physiologisch-chemischen Institut der Universität Strassburg. Jena, Gustav Fischer. 1903.

The progress which recent years have contributed in the study of the comparative morphology and physiology of animals has largely been emphasized along non-chemical lines. This is due not so much to an absence of chemical data which are of interest and importance in animal biology as to the difficulty which the student has experienced in collecting and correlating what has already been ascertained in this direction. There is no

dearth of observations which may be expected to throw light on the chemical reactions and metabolic processes of the lower animals; but they are scattered so widely through the literature, and they appear so isolated in their bearing, that an adequate systematic presentation of the comparative chemistry of animals has never been attempted before the publication of the book by Dr. von Fürth. Indeed, it must be acknowledged that few individuals have acquired the wide biological experience and chemical training which are demanded for the successful accomplishment of such a task.

In the opinion of the writer, Dr. von Fürth's book is one of the most important recent additions to the literature of physiological chemistry. Its value lies not only in the compilation of an orderly digest of an enormous number of scientific papers, most of which have apparently been consulted in the original; equally satisfactory is the critical attitude which has been assumed in editing the heterogeneous experimental material. And it is, perhaps, not so much in the classification of facts and the orderly treatise on comparative physiological chemistry, as in the exposition of the deficiencies of our knowledge, that the biological investigator will find the work helpful and stimulating. In almost every chapter the author has pointed out lines of experimental inquiry—biochemical problems which demand solution. What has already been attained makes it clear that we may expect still greater advances in biology to follow the more extensive application of comparative chemical methods in this domain. A review of the current text-books will readily convince one upon what slender basis many chemical considerations, handed down without verification from writer to writer, really rest. As von Fürth remarks, too many have contented themselves with the principle:

"Nur muss man sich nicht allzu ängstlich quälen;
Denn eben wo Begriffe fehlen,
Da stellt ein Wort zur rechten Zeit sich ein.
Mit Worten lässt sich trefflich streiten,
Mit Worten ein System bereiten,
An Worte lässt sich trefflich glauben,
Von einem Wort lässt sich kein Iota rauben."

New experiments and fresh facts are wanted; and the encouragement which this volume offers will bring results. When, for example, the physiological chemist shall be able to differentiate the proteid substances according to their chemical structure—a possibility which recent advances make by no means improbable—then we may truly group like with like and classify protoplasmic masses according to their chemical make-up. Then we may hope to accomplish along chemical lines also what the morphologists have long attempted with much success in determining the biological relationships of animals. In merely pointing out the gaps in our present knowledge von Fürth has done a useful service.

Von Fürth's book is not adapted to detailed review in this place. In an introductory chapter a résumé of the essential features of organic chemistry and of the physiologically important types of organic compounds has been given with unusual success. This will be a welcome recapitulation to the biologist unaccustomed to thinking in chemical ways. Succeeding parts deal with the chemical composition of protoplasm, the blood, respiration, nutrition, excretion, animal poisons, specific secretions, the muscles, the connective tissues, reserve and skeletal constituents, products of the sexual glands, and the chemical environment of animals. In each chapter an introductory historical sketch leads to detailed consideration of the topic in connection with the various groups of the invertebrates. The references to the literature are given in detail, experimental methods being included in many cases.

The completion of a task such as von Fürth has accomplished so well should not be made the occasion for unfavorable criticism. A number of typographical errors, aside from those noted in the appendix, remain uncorrected. It seems unfortunate that in Strassburg the work of American physiologists is still cited and known only through German abstracts. Dr. von Fürth deserves congratulation for his contribution to biochemical literature.

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